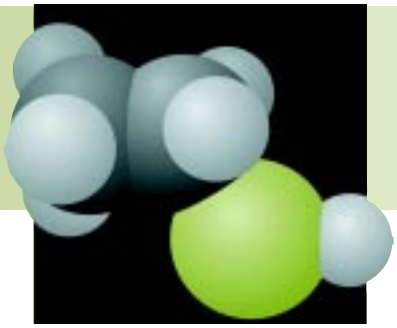
CHEMICALS

Project Fact Sheet



Alloy Selection System

Benefits

- *Implementation by 10 percent of U.S. chemical plants would result in energy savings of 10 trillion Btu per year*
- *Improves selection of alloys to fabricate equipment*
- *Allows for better equipment maintenance planning*
- *Helps process operators optimize process operations*
- *Reduces the number of unplanned outages*
- *Enhances productivity*

Applications

The data and information system developed by this project will be applicable to the entire chemical processing industry. Specific chemical applications include: ethylene furnaces, hydrogen plants, boilers, power plants, flares, and hydrotreating units. The developed tools will also be useful in the petroleum, forest products, food processing, power generation, alternative energy, and pharmaceutical industries to increase energy efficiency and productivity.

Software will predict corrosion rates to improve productivity in the chemical industry

Many aspects of equipment design and operation are influenced by the choice of the alloys used to fabricate process equipment. Making the right choice is often difficult and necessarily conservative for equipment used in high-temperature processes involving corrosive gases. This is due to the difficulty in confidently predicting alloy corrosion rates and expected equipment lifetimes. The alloy selection system for elevated temperatures ASSET project is greatly expanding upon existing databases and software to enhance the ability of the chemical industry to predict corrosion of commercial alloys in many different and complex conditions found in commercial processes. Better corrosion management of alloys under high tempurature, corrosive gas conditions will result in reduced energy use and less expensive maintenance, increased process safety, cost-effective use of expensive alloys in equipment designs, more confident use of lower cost alloys, and improved competitiveness.

ASSET will utilize a corrosion database linked to thermochemical calculation programs. The linked programs will use corrosion data measured under well-controlled conditions to predict the corrosion rates for commercial alloys with an initial database containing 5 million hours of data for 70 commercial alloys. This project will generate corrosion data for an extensive list of alloys exposed to a wide range of complex and corrosive gases at temperatures of 250° to 1,150°C.

ASSET Features

ASSET project technology helps industry manage corrosion of high temperature process equipment by:

- Gathering existing corrosion data
- Measuring additional corrosion data
- Adding data to ASSET to expand the range of process equipment conditions and alloy types to cover the diverse needs of industry
- Enhancing ASSET to evaluate process environment corrosivity and to predict corrosion behavior in process conditions
- Providing the technology to industry

Project Description

Goal: To develop and expand a high-temperature, gaseous corrosion information system that will allow the chemical process industries to better identify and use materials to fabricate high-temperature process equipment. ASSET will deal with several of the most prevalent corrosion mechanisms in high temperature equipment: oxidation, sulfidation, sulfidation/oxygenation and carburization.

Progress and Milestones

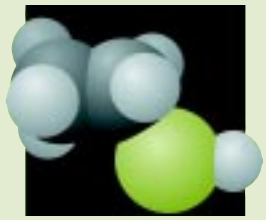
This project will encompass the three main task areas of software development, thermochemical modeling, and alloy corrosion testing. The software development task will make enhancements to the existing ASSET software. The thermochemical modeling tasks will expand the applicable temperature range, use accurate models for realistic alloys, and improve the ability to accurately evaluate corrosive environments. Corrosion testing will expand the number of alloys in the ASSET system and increase the accuracy of predictions with the existing alloys. Tests will generate well-defined alloy corrosion for the wide ranges of conditions found in chemical processes. These tests will measure the maximum depth of corrosion thickness, and identify the types of corrosion products formed.

This project includes the following activities:

- Develop thermodynamic solution phase models for Fe-Ni-Cr-Co-O Systems for oxides, metals, carbides, and sulfides over the temperature range of 250 - 1,150°C
- Complete sulfidation, sulfidation/oxidation, and carburization testing of alloys in representative conditions
- Complete oxidation testing of alloys in conditions of low oxygen concentrations, in air conditions, and in conditions of high oxygen concentrations
- Complete upgrade and release of ASSET Information Based System

Commercialization

The commercialization of the project results will be an ongoing process throughout the life of the project. Each company participating in the project will have immediate access to the most recent version of ASSET and will be trained its use. Participation in the project by the Materials Technology Institute (MTI) iallows more than 55 companies to access the software as it develops and after it is finished.



Project Partners

Research Team

Shell Oil Company
Houston, TX

Oak Ridge National Laboratory
Oak Ridge, TN

Humberside Solutions, Ltd.
Toronto, Ontario, Canada

The Royal Military College of Canada
Kingston, Ontario, Canada

Ecole Polytechnique de Montreal
Montreal, Quebec, Canada

Industrial Participants

Texaco
Houston, TX

KEMA
Arnhem, Netherlands

Caterpillar
Peoria, IL

Creusot-Loire
Cedex, France

Special Metals Corp.
Huntington, WV

Haynes International
Kokomo, IN

Materials Technology Institute
St. Louis, MO

Foster Wheeler Development Corp.
Livingston, NJ

For additional information, please contact:

Charles Sorrell
Office of Industrial Technology
Phone: (202) 586-1514
Fax: (202) 586-6507
charles.sorrell@ee.doe.gov

Please send any comments, questions, or suggestions to webmaster.oit@ee.doe.gov

Visit out home page at www.oit.doe.gov/chemicals

Office of Industrial Technologies
Energy Efficiency
and Renewable Energy
U.S. Department of Energy
Washington, D.C. 20585

OIT

February 2001